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NEW AND LITTLE KNOWN KANGAROO RATS OF
THE GENUS *PERODIPUS*.

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The kangaroo rats, a group peculiar to the arid parts of North America, are represented by three genera—*Dipodomys*, *Perodipus*, and *Microdipodops*. The latter is very much more distinct from the others than they are from each other. *Dipodomys* and *Microdipodops* have been previously studied, and the species have been published, but up to the present time only a beginning has been made in working out the species of *Perodipus*. A study of the rich collections of the Biological Survey leads me to recognize nine new forms, which are here described. One of these, named *ingens*, is a very large animal for a kangaroo rat, equaling in size *Dipodomys spectabilis* from Arizona and New Mexico. It inhabits the hot Carrizo Plain and adjacent southern end of the San Joaquin Valley in California. Another species, *P. microps*, from Lone Pine, Owens Valley, is the smallest of the genus thus far discovered, being smaller even than *ordi* and *columbianus*.

A curious feature connected with the kangaroo rats of this genus is that most of the species and subspecies may be arranged in four groups according to size: The small *ordi* group, the slightly larger *montanus* group, the decidedly larger *agilis* group,

and *ingens*, the largest of all. Another interesting feature is that in many localities two species occur together, and in several places three may be found within a distance of a few miles. The various species appear to be highly sensitive to climatic conditions, and adhere very closely to definite zone positions. As a result, it is not uncommon in the Great Basin region to encounter two or three species in ascending from the bottom of a desert valley to the adjacent mountain slopes. The great majority of species belong to the Upper Sonoran zone, of which some inhabit the upper part, some the lower. A few belong to the Lower Sonoran and Transition zones respectively, and one species—*montanus* of Baird—apparently enters the lower edge of the Boreal.

Like the other kangaroo rats, the members of the genus *Perodipus* are primarily desert animals. A few species inhabit the bare open deserts, but most of them live in the brushy deserts, and at least two of the California species—*streator* and *venustus*—live among the manzanita thickets of the mountain slopes—a very curious place in which to find a kangaroo rat. One of these species, *venustus*, inhabits the Santa Cruz Mountains, and was also obtained by the Goldman brothers and myself on the very top of Santa Lucia Peak, in the coast ranges, at an altitude of 6000 feet.

Note on *Perodipus montanus* Baird.

Dipodomys montanus Baird, Proc. Acad. Nat. Sci. Phila., VII, p. 334, 1855.

Perodipus montanus of Baird is a well-marked species, a little larger than *ordi*, but decidedly smaller than *agilis*, *longipes*, and *richardsoni*. It was collected by F. Kreuzfeldt on Captain Beckwith's expedition, in San Luis Valley, south central Colorado, near Old Fort Massachusetts (now Fort Garland), from which point the Biological Survey has obtained a large series of topotypes. By a curious error, Dr. E. A. Mearns has identified the species with *Dipodomys elator* Merriam of Texas (Proc. Biol. Soc. Wash., XIII, 167, Oct. 31, 1900). Fortunately, Baird's type specimen of *montanus* is still in existence, in the U. S. National Museum. Comparison of this type with the above-mentioned series of topotypes shows them to be identical, and to differ widely from *Dipodomys elator* of Texas.

Doctor Mearns may have been misled by the fact that the fifth toe (really the thumb) which distinguishes *Perodipus* from *Dipodomys* is not apparent in the type specimen, for the reason that the hind feet were skinned down to the toes and the bones removed. In all other respects it

agrees with the topotypes of *montanus*. Externally it has the small ears and relatively small, pale, crested tail of *P. montanus*, thus differing widely from *Dipodomys elator*, which has larger ears and a long round tail ending in a pure white brush about an inch in length, below which the upper and under tail stripes are nearly black. The whitish tip in the type of *montanus* is widely different, and results from the wearing off or suppression of the pale brownish wash which usually suffuses the tips of the hairs. Some of the topotypes are in exactly the same condition and match the type perfectly.

In comparing skulls of topotypes of *P. montanus* with those of *D. elator*, it appears that *montanus* has weaker and narrower maxillary arches, narrower nasals, narrower premaxillæ, and narrower rostrum as a whole, and also differs in the enamel face of the upper incisor teeth. In all of these characters, the skull of Baird's type specimen, although not fully adult and somewhat imperfect, agrees with the topotypes and departs from *D. elator*. Furthermore, *P. montanus* came from the neighborhood of Fort Garland at an altitude of nearly 8000 feet, in the upper part of the Transition zone, while *D. elator* came from Henrietta, Texas, at an altitude of less than 1000 feet and in the Lower Sonoran zone.

Perodipus montanus may be known from the following description :

Characters.—Size medium or rather small ; tail rather short ; ears small ; upperparts dull buffy ochraceous, abundantly lined on the head with fine dark-tipped hairs ; the back in summer pelage shading toward clay-color, produced by brownish tips to the hairs ; end of nose above the small white tip indistinctly dusky ; patch at base of whiskers dusky ; upper or interior fold of ear pale fulvous, with a dark spot near the tip, followed by a small whitish point which comes over from the back side of the ear, which is mainly white ; upper tail stripe pale brownish drab, normally continuous to extreme tip ; under tail stripe narrowing toward tip, and often absent beyond end of vertebræ.

Skull.—Intermediate in size between *ordi* and *richardsoni* ; rostrum, nasals, and premaxillæ rather narrow ; bullæ rather large for size of skull ; maxillary arch rather weak and narrow, but with well-developed rounded outer angle ; supraoccipital and interparietal broad. The skull as a whole closely resembles that of *ordi*, but is larger, the total length averaging about 38 mm. instead of 36. The maxillary arch is actually only a trifle larger than in *ordi*, thus being relatively smaller.

Measurements.—Average of 40 specimens from type locality: Total length, 250 ; tail vertebræ, 140 ; hind foot, 40.8.

***Perodipus ingens* sp. nov. -**

Type from Painted Rock, 20 miles southeast of Simmler, Carrizo Plain, San Luis Obispo Co., California. Adult male, No. 128,805, U. S. National Museum, Biological Survey Collection. August 6, 1903. Luther J. Goldman. Original No. 777.

Characters.—Size huge, not only very much larger than the largest known species of *Perodipus*, but equaling *Dipodomys spectabilis*. Skull about double the bulk of the largest previously known *Perodipus*, and relatively heavy and massive. Color buffy ochraceous; upper and lower tail bands black, uniting at end of vertebræ, beyond which the pencil is white, superficially washed with dusky (chiefly on upper surface). Ears relatively small, actually not larger than in *agilis*.

Measurements.—Type specimen: Total length, 360; tail vertebræ, 191; hind foot, 54. Average of 6 specimens: Total length, 350; tail vertebræ, 190; hind foot, 52. Skull of type: Total length, 48 mm.; occipito-nasal length, 45; basal length, 34; zygomatic breadth, 23.5; breadth across bullæ, 30.5; breadth of frontals posteriorly, 17, behind lachrymals, 15; length of nasals, 18.

Remarks.—*Perodipus ingens* so greatly exceeds in size all known species of the genus that no comparison is necessary. Its range, so far as known, is the Carrizo Plain and adjacent southwestern border of the San Joaquin Valley. Specimens were collected by L. J. Goldman at three localities: Carrizo Plain (8 miles east of Simmler), Painted Rock (20 miles southeast of Simmler), and McKittrick (in western Kern County, about 35 miles west of Bakersfield). Whether or not it spreads over suitable parts of the Kern-Tulare basin remains to be ascertained.

***Perodipus venustus* sp. nov.**

Type from Santa Cruz, Santa Cruz Co., California. Adult male, No. 51,852, U. S. National Museum, Biological Survey Collection. March 12, 1893. G. B. Badger. Original No. 46.

Range.—Santa Cruz and Santa Lucia Mountains, California.

Characters.—In size and general characters similar to *P. agilis*, but color *very much darker*; nose black, passing into black band at base of whiskers; top of head, back, and thigh patches dusky, finely grizzled with ochraceous, the ochraceous becoming more distinct on sides; ears large and nearly black, with the usual pale spots at base, and at top of fold; ankle, sides of heel, sole, and tail stripes nearly black; hairs of rump forming a black patch just in front of basal white ring of tail.

Skull.—Similar to that of *agilis* but slightly longer; maxillary arch of zygoma broader on outer side, with a pronounced outer angle (lacking in *agilis*); jugal weaker; nasals slightly larger (both longer and broader); premaxillæ broader; incisors heavier. Compared with *P. tularensis*, the nasals and premaxillæ are broader, the outer angle of maxillary arch less developed, the bullæ more projecting posteriorly.

Measurements.—Type specimen: Total length, 339; tail vertebræ, 211; hind foot, 46. Average of 14 from type locality: Total length, 316; tail vertebræ, 191; hind foot, 45.3.

Perodipus goldmani sp. nov. -

Type from Salinas, mouth of Salinas Valley, Monterey Co., Calif. Young-adult male, No. 118,924, U. S. National Museum, Biological Survey Collection. September 4, 1902. Luther J. Goldman. Original No. 431.

Characters.—Size large, nearly as large as *venustus*, but tail shorter and ears smaller. Coloration intermediate between the paler *agilis* and the darker *venustus*. Upperparts finely mixed dusky and buffy ochraceous, resulting in a drab-brown which covers the head and back, becoming grizzled ochraceous on the flanks; dusky marks at base of whiskers and on ankles large and conspicuous.

Skull.—Similar to that of *tularensis*, but nasals and premaxillæ broader.

Measurements.—Type specimen: Total length, 312; tail vertebræ, 185; hind foot, 46. Average of 8 from type locality: Total length, 313; tail vertebræ, 185; hind foot, 45.4.

Perodipus agilis tularensis subsp. nov.

Type from Alila, Tulare Co., California. Adult female, No. 127,158, U. S. National Museum, Biological Survey Collection. June 23, 1903. Luther J. Goldman. Original No. 563.

Characters.—Externally like *agilis*; tail slightly longer. Skull similar, but maxillary arches more strongly developed, more broadly spreading, broader antero-posteriorly on outer side, and developing a prominent recurved angle; premaxillæ longer on top of skull (alongside nasals), constricting nasals more abruptly just behind anterior third; sides of frontoparietal shield less parallel (approximating anteriorly). The skull resembles that of *panamintinus* (with which it agrees in size), but differs strikingly in the nasals, which are shorter, and anteriorly are broader and more abruptly spreading. The supra-occipital is narrower than in *panamintinus*, allowing the bullæ to come nearer together. Externally *panamintinus* is much paler. The skull of *tularensis* compared with that of *venustus* is slightly smaller, nasals and premaxillæ narrower, outer angle of maxillary arch more prominent, bullæ less produced posteriorly.

Remarks.—Specimens are at hand from Alila and Tejon Canyon.

Measurements.—Type specimen: Total length, 308; tail vertebræ, 182; hind foot, 41.

Perodipus montanus utahensis subsp. nov. -

Type from Ogden, Utah. Adult male, No. 55,115, U. S. National Museum, Biological Survey Collection. July 15, 1893. Vernon Bailey. Original No. 4085.

Characters.—Similar to *montanus*, but hind foot slightly smaller and decidedly more slender; upperparts less fulvous and more drab or clay

color; ears darker, the anterior fold dusky except at extreme tip; under tail-stripe continuous to tip of pencil.

Skull.—Like that of *montanus*, but frontals narrower anteriorly, and tympanic capsule smaller (shorter), with the underpart weak anteriorly.

Measurements.—Type specimen: Total length, 260; tail vertebræ, 150; hind foot, 41. Average of 10 from type locality: Total length, 260; tail vertebræ, 147; hind foot, 40.2.

***Perodipus streator* *simulans* subsp. nov.**

Type from Dulzura, San Diego Co., California. Adult female, No. $\frac{33195}{45163}$, U. S. National Museum, Biological Survey Collection. November 24, 1891. C. H. Marsh. Original No. 255.

Characters.—Externally so similar to *streator* that I have found no constant difference except that the end of tail is not white. In spring (end March) and early fall (August), and probably summer also, the color is paler and more ochraceous than in late fall (October). In October specimens the dusky of the back prevails over the tawny or pale fulvous tones.

Skull like that of *streator*, but maxillary arch of zygoma less spreading laterally, and cranium less squarely rectangular. In a series of skulls of *streator* placed side by side the maxillaries almost touch; in a corresponding series of *simulans* they are separated by an interval of about 4 mm.

Some specimens (about 1 in 10) of this subspecies appear to be intermediate between the genera *Dipodomys* and *Perodipus*, inasmuch as they lack the hallux or the hallux has no claw, thus having only 4 claws instead of 5.

Remarks.—This is a wide-ranging form. The Biological Survey collection contains specimens from Dulzura and Twin Oaks (near San Marcos) in San Diego County, and thence northward at least to Morro in San Luis Obispo County.

Measurements.—Type specimen: Total length, 280; tail vertebræ, 165; hind foot, 40. Average of 10 from type locality: Total length, 285; tail vertebræ, 172; hind foot, 41.

Average of 10 *streator* from type locality (Carbondale, Mariposa County): Total length, 286; tail vertebræ, 175; hind foot, 42.

***Perodipus cabezonae* sp. nov. —**

Type from Cabezon, Colorado Desert, California. Adult female, No. 54,055, U. S. National Museum, Biological Survey Collection. May 31, 1893. C. P. Streater. Original No. 2859.

Characters.—Size rather small (between *ordi* and *panamintinus*); ears rather large; color buffy ochraceous. Externally most like *panamintinus*, but ear slightly larger; hind foot shorter; nose paler (usual dark patch obsolete); head and face more fulvous.

Skull.—Rather long and narrow; sides of fronto-parietal shield approximating anteriorly; maxillary arches compressed. Compared with *panamintinus* and *agilis* the maxillary arches are much less spreading, their outer margins slope more strongly backward, and the frontals are narrower between lacrymals (more wedgeshape).

Measurements.—Type specimen (female): Total length, 275; tail vertebræ, 162; hind foot, 42. Average of 8 from type locality: Total length, 282; tail vertebræ, 171; hind foot, 42.3.

***Perodipus microps* sp. nov.**

Type from Lone Pine, Owens Valley, Inyo Co., California. Adult male, No. $\frac{25288}{32701}$, U. S. National Museum, Biological Survey Collection. December 22, 1890. E. W. Nelson. Original No. 138.

Characters.—Size small, as in *ordi* and *columbianus*; ears small and pale; color pale buffy ochraceous, much paler than *ordi* and *columbianus*.

Skull.—Small and rather narrow, and very different from that of any known species; compared with *ordi* and *columbianus*, braincase narrower; nasals narrower; premaxillæ broader; parietals (together) much more acutely pointed posteriorly; breadth of single parietal much less than length (in *ordi* length and breadth subequal), maxillary arch much weaker and more slender, without external angle; supraoccipital between bullæ narrower; incisors thinner (anteroposteriorly) and more vertical (less incurved).

Measurements.—Type specimen: Total length, 282; tail vertebræ, 165; hind foot, 41. Average of 5 from type locality: Total length, 270; tail vertebræ, 158; hind foot, 40.6.

***Perodipus microps levipes* subsp. nov.**

Type from Perognathus Flat, Emigrant Gap, Panamint Mountains, California (altitude 5200 ft.) Adult male, No. $\frac{27176}{34375}$, U. S. National Museum, Biological Survey Collection. April 16, 1891. Vernon Bailey. Original No. 2668.

Characters.—Size small, little larger than *microps* from Lone Pine; ears small; color pale buffy ochraceous, as in *microps*. Skull small, with large posteriorly bulging bullæ, and narrow, weak maxillary arches. Compared with *microps* the hind foot and skull as a whole are larger; bullæ decidedly larger; parietals less acutely pointed posteriorly. From *P. cabezonæ*, which has equally large bullæ, it may be told at a glance by the small, narrow, weak, and tapering maxillary arches, and by the very much smaller ears.

Measurements.—Type specimen: Total length, 288; tail vertebræ, 156; hind foot, 43. Average of 10: Total length, 289.5; tail vertebræ, 164; hind foot, 42.4. Total length of skull 38, contrasted with 35 for *microps*.